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CLIMATOLOGICAL ASPECTS OF NIMBUS-7 SMMR DATA

by

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An algorithm has been developed for calculating simultaneously SSTs, SWs, and TAUs on a global basis using only the 6.6 and 18 GHz channels of the SMMR. These channels were found to have small and easily correctable drifts over the 9-year SMMR lifetime. Samples of the retrievals have been calculated in each of eight of the SMMR years and found to produce independent results, consistent with weather charts and climatic records, even in the presence of high winds. Another new algorithm for calculating high-latitude scalar winds from Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) data has been devised and tuned with surface observations from a number of documented Arctic Polar Low events. The algorithm utilizes the horizontally and vertically polarized radiances from the 0.8 and 1.7 cm wavelength channels of the ten-channel SMMR to retrieve near surface oceanic scalar winds and cloud water in the column, and takes advantage of the relatively small fluctuations in atmospheric water vapor at high latitudes. An advantage of this algorithm for high-latitude winds from SMMR over the global algorithm is an inherently better spatial resolution as a result of the shorter wavelengths used. Thus retrievals closer to land and sea ice margins are possible. Model calculations were used to determine the effect of cloud water on the multispectral radiances and the surface observations were used for the wind effect. Surface data sets used for the tuning included detailed weather observations from the 1984 Arctic Polar Lows and the Marginal Ice Zone Experiments, and an archive of polar low events compiled at the Norwegian Meteorological Service for Northern Norway. The estimated standard error of the wind retrievals from the algorithm as it now stands is 10 knots, with a correlation coefficient of 0.82. Spatial resolution is about 50 km, and the sampling interval is about 15 km for the SMMR.

Data from the Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) have been used to provide a seven-year record of sea ice coverage in the northern and southern polar areas, for the period of November 1978-1985 (See Figure 1.). During this period, the maximum coverage in the Southern Hemisphere was found to be trendless, and to vary +/- 0.5 X 1OE6 sq km about a mean of 15.1 X 1OE6 sq km, with a precision of about 0.1 X 1OE6 sq km. The maximum coverage in the Northern Hemisphere was also found to be trendless with a variation even less than in the Southern, +/0.3 about a mean of 12.9 X 1OE6 sq km. Variations in the minimum sea ice coverage were comparable in the Northern Hemisphere, and smaller in the Southern. The trendless total global sea ice coverage had maxima and minima of 22.5 +/- 0.5 and 14.6+/- 0.5 X 1OE6 sq km, respectively. If areal variations of sea ice cover are indeed a significant indicator of global climate change, such as an average global temperature change, these data indicate that no such change took place during this period. While the variations in the extrema of the hemispherical ice covers show no trends, the phase of the oscillations is not constant, resulting in significant changes in the shape of the oscillations of the total global ice coverage.